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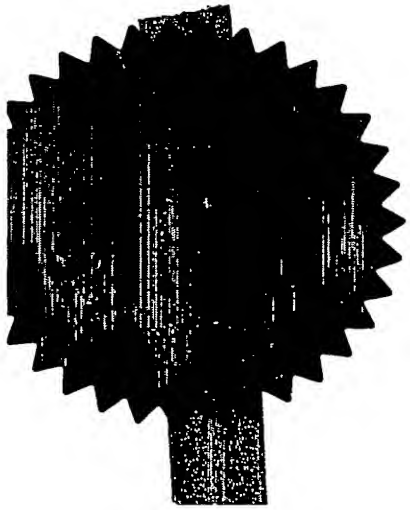

Signed Andrew Gerry

Dated 10 September 2003

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15NOV02 E743743-1 003126
P01/7700 0.00-0226677.3

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2.	Patent application number *(The Patent Office will fill in this part)*	0226677.3	15 NOV 2002
3.	Full name, address and postcode of the or of each applicant (*underline all surnames*)	Duckworth & Kent Ltd Terence House 7 Marquis Business Centre Royston Road Baldock Hertfordshire SG7 6XL	
	Patents ADP number (*if you know it*)	6741227002	
	If the applicant is a corporate body, give the country/state of its incorporation	United Kingdom	
4.	Title of the invention	OPHTHALMIC LENS DELIVERY SYSTEM	
5.	Name of your agent (*if you have one*)	**W. P. Thompson & Co.**	
	"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*	Eastcheap House, Central Approach Letchworth Herts SG6 3DS	
	Patents ADP number *(if you know it)*	158003	
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7.	If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application	Number of earlier application	Date of filing *(Day/month/year)*
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Description	7
Claims	
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Drawing(s)	4

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Statement of inventorship and right to grant of a patent *(Patents Form 7/77)*	
Request for preliminary examination and search *(Patents Form 9/77)*	
Request for substantive examination *(Patents Form 10/77)*	
Any other documents *(Please specify)*	

11. We request the grant of a patent on the basis of this application

Signature W.P. Thompson & Co Date November 14, 2002

W. P. Thompson & Co.

12. Name and daytime telephone number of person to contact in the United Kingdom

Roger B Thomson
01462 682139

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OPHTHALMIC LENS DELIVERY SYSTEM

This invention relates generally to instruments for use in the insertion of an intraocular lens into an eye. It is necessary in certain ophthalmic surgical procedures to insert an intraocular lens through a small incision, such as in the phacoemulsification technique for removing cataracts. In our pending UK patent application GB0217491.0 there is described methods of and instruments for using thin lenses in such a way that they can be inserted into an incision of very small dimensions, for example of as little as 2mm. With the availability of thin lenses, which can have a thickness of as little as 0.4mm, there is a consequent desire on the part of ophthalmic surgeons to be able to use ever smaller incisions in the eye.

In our aforesaid patent application there is described a method of preparing a thin ophthalmic lens for insertion into the eye, which comprises rolling the lens into a tubular configuration.

There is also described a device for rolling a thin ophthalmic lens into a tubular configuration, which comprises a pair of members slidable one relative to the other, one of the members serving to receive and locate the lens, and the movement being arranged to cause rolling of the lens into the tubular configuration. Again in the aforesaid pending application, an embodiment is described which is based upon an instrument of the type described in GB2335148B, which can be thought of as a broken-barrel injector, where the nose is pivotable through 90°.

In the description of that preferred embodiment, the lens rolling mechanism comprises a lens roller base which is slidable transversely to the longitudinal axis of the instrument. The lens is rolled between two concave recesses, one on the lens roller base and the other in the nose of the instrument. The alignment of the lens roller base and the

nose is effected by the use of projecting pins which are received in bores, with a check stop in the form of a pin holding the nose and lens roller base in their engaged position.

The present invention is concerned with an improved lens rolling delivery system.

It is an object of the present invention to provide a lens rolling delivery system which avoids the need for alignment pins and for a check pin to maintain the closed engagement.

It is a further object of the present invention to provide a lens rolling delivery system which is easier to manufacture than the mechanism described in the aforesaid patent application, but yet which functions efficiently and reliably.

This is achieved in accordance with the invention by the use of a carriage comprising a member slidable transversely relative to the nose of the instrument, the member receiving and locating the lens and its movement being arranged to cause rolling of the lens into a tubular configuration, wherein the correct location of the slidable member for delivery of the lens is effected by a click-stop mechanism in combination with resilient biasing means.

The resilient biasing means is preferably a springy arcuate member located on the slidable member and engageable against the nose portion of the instrument, biasing the slidable member in the retractable direction against the force of the click-stop mechanism.

The click-stop mechanism is preferably a flexible strip projecting from the body of the slidable member and engageable behind an abutment provided on the nose portion of the instrument.

The instrument is preferably formed in two parts, a main body portion and a nose portion which are a press fit.

In order that the invention may be more fully understood,

a presently preferred embodiment of lens delivery system in accordance with the invention will now be described by way of example and with reference to the accompanying drawings, in which:

Fig. 1 is a top plan view of an injector instrument embodying the lens delivery system of the present invention;

Fig. 2 is a side view of the instrument shown in Fig. 1, but with the plunger fully depressed after insertion of the lens;

Fig. 3 is a plan view, on an enlarged scale, of the lens roller base;

Fig. 4 is a plan view of the lens roller base;

Fig. 5 is a side view of the lens roller base of Fig. 4;

Fig. 6 is the end view of the lens roller base shown in Figs. 4 and 5;

Fig. 7 is a side view of the main body of the injector instrument;

Fig. 8 is a plan view of the nose portion of the instrument;

Fig. 9 is a side view of the nose portion shown in Fig. 8;

Fig. 10 is the underneath plan view of the nose portion shown in Figs. 8 and 9; and,

Fig. 11 is an end view of the nose portion shown in Fig. 9, viewed from the right-hand end.

Referring first to Figs. 1 and 2, these show the complete injector instrument 10 for the insertion of an intraocular lens into an eye. The instrument 10 comprises a body portion 12, which is shown in more detail in Fig. 7. At the forward end of the body portion 12 is a nose portion 14, which is shown in more detail in Figs. 8 to 11. The main body 12 and the nose portion 14 are a press fit, using a pair of upper pins 16 and a single lower pin 18 to maintain their alignment. The nose portion 14 is provided with a pair of bores 20 to receive the upper pins 16, and with a smaller diameter bore

22 to receive the lower pin 18. Projecting rearwardly from the main body of the instrument is a plunger 24 which is arranged to be depressed relative to a flange 26. Forwardly of the flange 26 is a bayonet fitting 28 which enables the plunger and the associated parts to be withdrawn from the main body of the instrument for cleaning and sterilisation.

Forwardly of the plunger 24, although not shown in the drawings, is a push rod which is encircled by a spring. The forward end of the push rod acts on the lens to deliver it through the nose. The plunger and centre rod are preferably made of PEEK material, which is particularly appropriate for use with a titanium instrument because of its smooth sliding movement over titanium surfaces.

The lens rolling delivery system of the present invention will now be described. The delivery system comprises a lens roller base 30, which is shown in use in Fig. 1 and in more detail in Figs. 4 to 6. The lens roller base 30 is arranged to be slidable transversely to the longitudinal axis of the instrument 10. In Fig. 1, the lens roller base 30 is shown in its position of maximum extension to one side of the instrument. It is arranged to slide linearly across the instrument. The lens roller base 30 comprises a generally rectangular block of PEEK material, a material chosen to slide smoothly relative to the adjacent surfaces of titanium or titanium alloy. The base 30 comprises a flat, relatively thin front portion 32, with a substantially thicker rear portion 34. Between these two portions is an intermediate stepped portion 36. The forward edge of the intermediate stepped portion 36 is shaped to define a concave recess 38 extending across the width of the base. This recess can have a diameter of approximately 1.30mm. At the upper margin of the concave recess 38 is a land or "flat" at the top of the arc, indicated in Figs. 5 and 6 at 40. The thicker end portion 34 of the lens roller base is provided with a forwardly extending arcuate spring portion 42 which, when the lens roller base is

pushed through the nose portion of the instrument, is arranged to abut against the side face of the nose portion and by doing so be deformed so as to exert a biasing force in the retractable direction. The two arms of the spring 42 are made sufficiently resilient to enable this effect to be achieved. The thinner portion 32 of the lens roller base is provided with one part of a click-stop mechanism, namely a side arm 44 which has a degree of flexibility and the end of which projects out beyond the side of the base in the form of a tongue. On the inside of the projecting tongue 44 is a closed-end slot 46 in the base material. The tongue 44 can thus be depressed into the slot 46 by pressure exerted on the outside of the end of the tongue.

Figs. 8 to 11 show details of the nose portion 14 of the instrument. The forward end of the nose portion 14 is shaped as a nozzle with an internal bore through which the lens is pushed towards the incision in the eye. The rearward portion of the nose is shaped to provide a longitudinally extending concave recess 48 between an upper horizontal surface 50 and a lower horizontal surface 52, as shown most clearly in Fig. 11. The diameter of the concave recess 48 is 1.30mm, i.e. the same as the diameter of the concave recess 38 in the lens roller base 30. The arrangement is such that the two concave recesses 38 and 48 are in alignment facing one another. Also, the centre of curvature of the concave recess 48 is coincident with the longitudinal axis of the bore through the nozzle and of the injection instrument. The nose portion 14 is also provided with a cut-out or recess 54 which is arranged to latch with the tongue 44 of the lens roller base, to function as a click-stop mechanism. The cut-out 54 defines an abutment against which the tongue 44 is engageable.

In use, with the plunger 24 retracted as shown in Fig. 1, and with the lens roller base 30 slid to the open side as shown also in Fig. 1, a thin lens 56 is placed on the flat surface 58 of the lens roller base, with its periphery within

the concave recess 38. The lens roller base is then pushed transversely relative to the longitudinal axis of the instrument so that it slides across the nose portion 14. As the lens 56 approaches the concave recess 48 in the nose 14 its periphery will engage the surface of this recess and will begin to roll upwards around the inside of the recess. As the sliding movement continues, and as the two concave recesses approach one another, the rolling edge of the lens will strike against the land 40 at the upper margin of the concave recess 38 in the lens roller base and will be brought to a stop. Continuing closure movement will then cause the lens to be rolled up within the cylindrical cavity defined by the two convex recesses. The lens will be rolled into a spiral within this cavity. The rolled lens will then have a diameter of approximately 1.3mm. When the lens roller base 30 has been advanced to its maximum distance, the projecting tongue 44 which has been depressed into the slot 46 during the movement of the lens roller base will reach the cut-out 54 in the nose portion and will latch into this recess 54. At the same time, the arms of the spring member 42 on the lens roller base will have been displaced by engagement against the nose and will be exerting a biasing force in the direction to retract the lens roller base. The combination of this biasing force and the latching of the tongue 44 in the recess 54 serves accurately to locate the lens for delivery by the push rod attached to the plunger.

After delivery of the lens through the incision in the eye, the lens roller base can be released from its delivery position by simply manually depressing the tongue 44 into the slot 46, whereupon the biasing force of the spring member 42 will retract the base sufficiently for it to be withdrawn to the position shown in Fig. 1.

The lens roller base 30 as shown and described is of a shape which is relatively easy to machine from titanium alloy, as compared with the use of alignment pins and bores. The

combination of the biasing means and the click-stop mechanism offers a simple solution in terms of ease of manufacture. Although the invention has been described above in relation to a thin lens which can be rolled to a diameter of about 1.3mm, the invention is not to be regarded as being limited to any particular dimensions. Similarly, the invention is not to be regarded as limited to lenses of any particular material. The invention is applicable to all lenses which are capable of being rolled in the manner described above.

Fig.1.

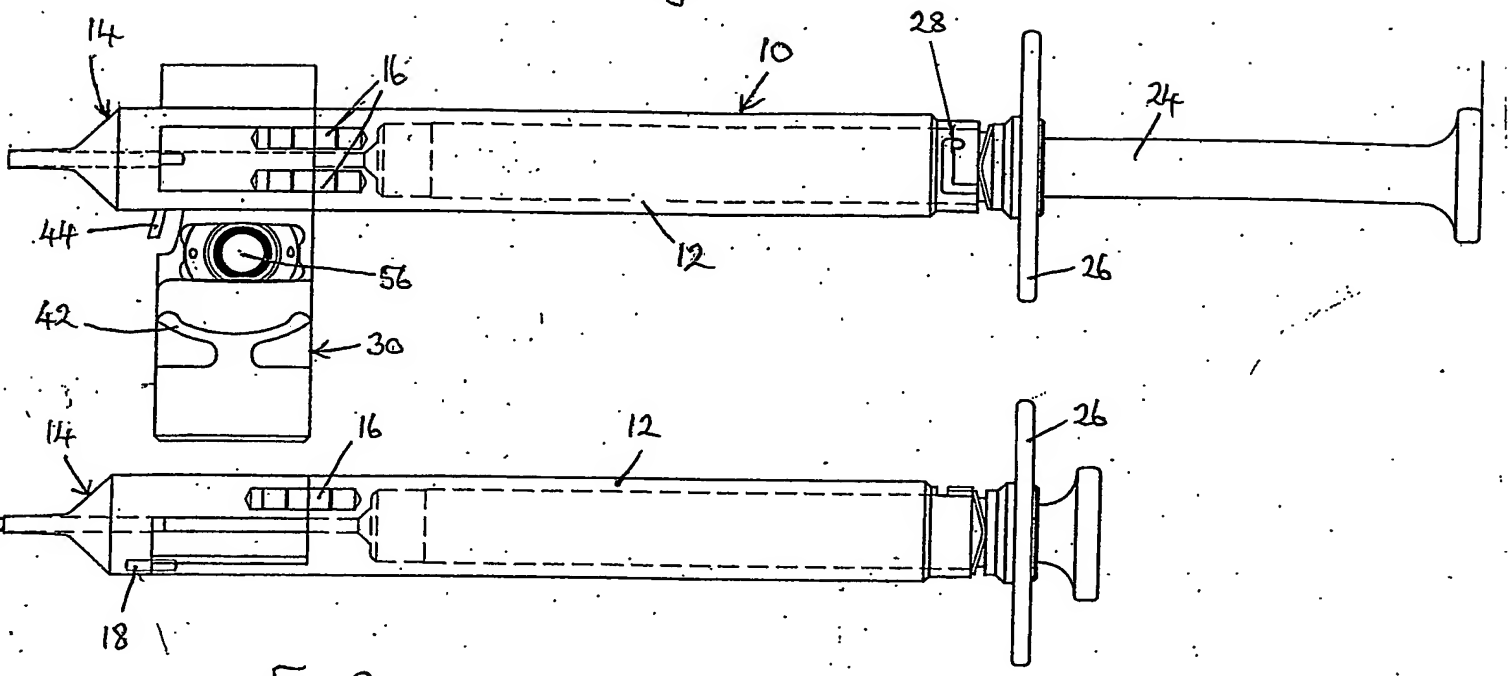


Fig.2.

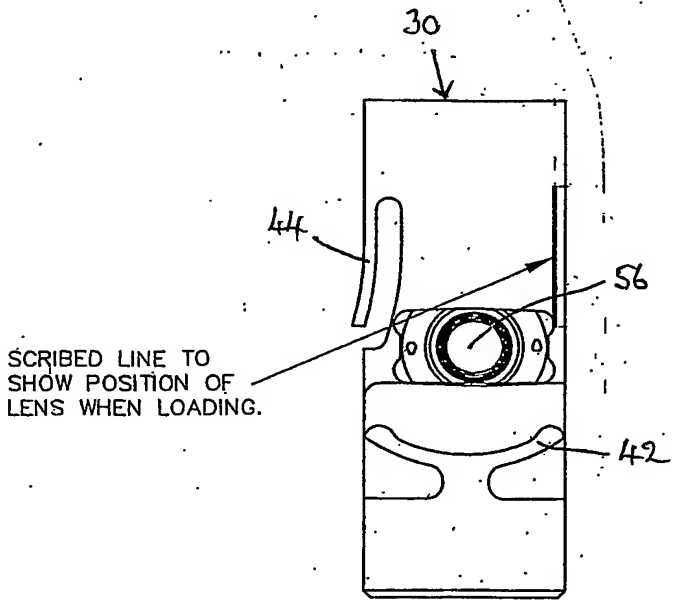


Fig.3.

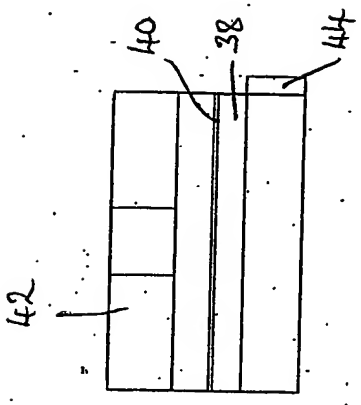
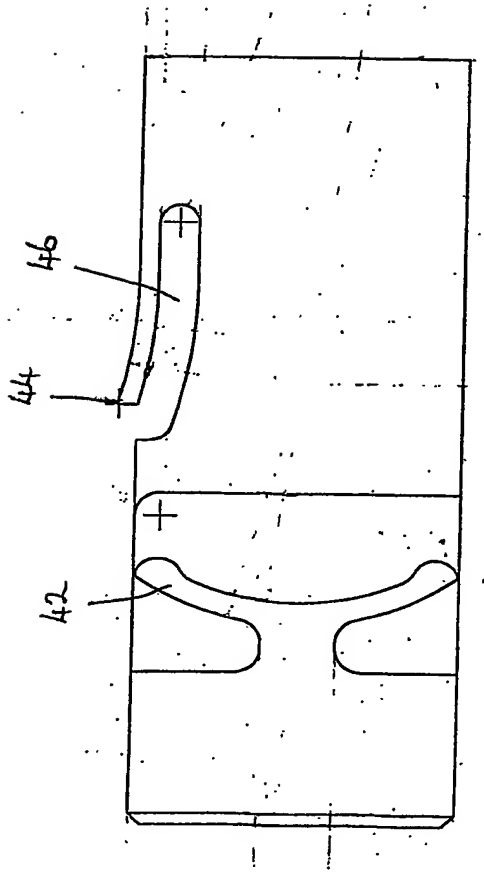


Fig. 6.

Fig. 4.



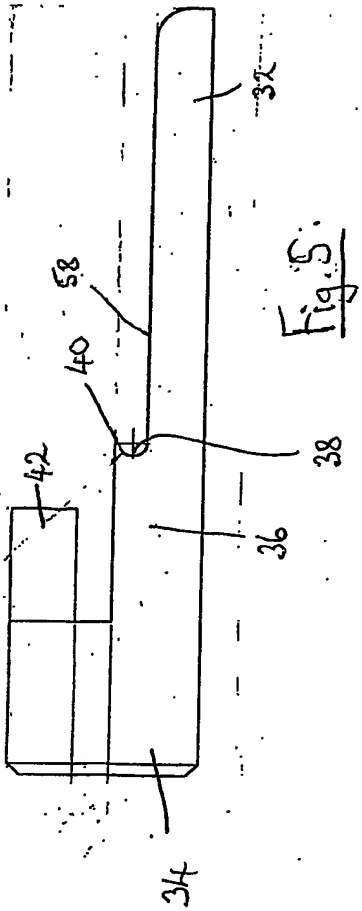


Fig. 5.

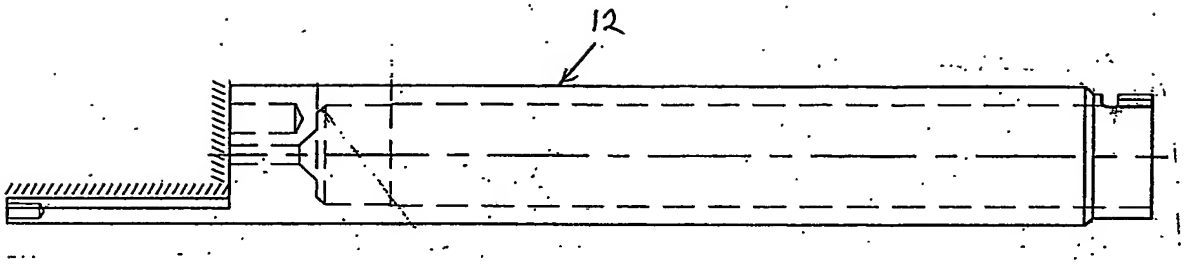


Fig. 7.

Fig. 8.

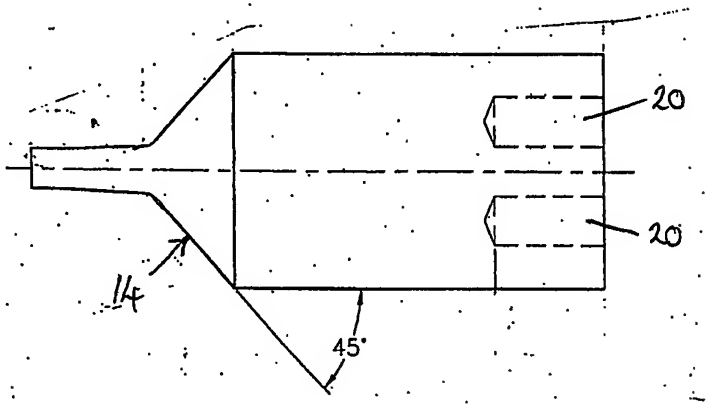
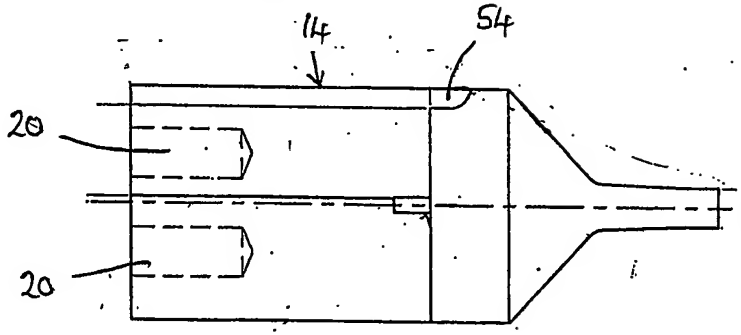


Fig. 10.



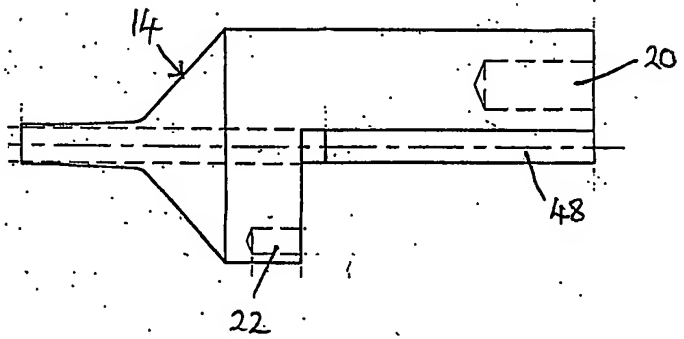


Fig. 9.

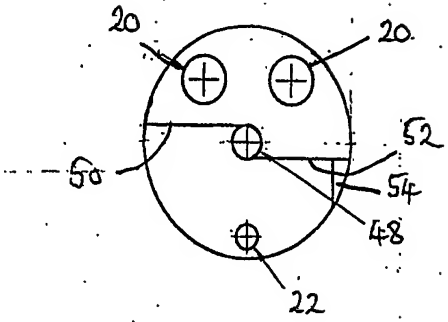


Fig. 11.

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